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Electronic Collection Management and Electronic Information Services

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Abstract

As the life cycle of information products has become increasingly digital from "cradle to grave," the nature of electronic information management has dramatically changed. These changes have brought new strategies and methods as well as new issues and challenges. At the bottom line the services are increasingly delivered to a desktop from distributed publishers or information providers. Information organizations act either as primary information providers or as brokers between the user and the primary service provider. There has also been a significant reorientation from concept of "ownership" of materials to that of "access" to information. This paper covers developments in the factors and strategies affecting collection management and access. It will also look at the major trends in electronic user services including electronic information delivery and electronic reference. Finally, it addresses the challenges in user and personnel education in response to an increasingly information literate user population.

1.0 Introduction

One of the earliest significant implementations of electronic information management for libraries and information centers began with dialup access to remote electronic databases. Dialog had its beginnings in 1964 when Lockheed Corporation began developing an interactive data retrieval system. In 1968 Lockheed realized the commercial value of the "Dialog" retrieval engine. By 1972, Dialog began offering public access through its interface to a collection of online bibliographic databases. The initial offerings included many scientific and technical areas. LexisNexis was founded in 1966 as the Data Corporation. In addition to bibliographic information, it was an early provider of full text of documents, initially in the legal area.

With the beginnings spawned by Dialog and LexisNexis, the face of information management has undergone a tremendous change. The Internet has further contributed to the success of remote information systems and databases. In the early 1960s, users connected to the online databases using dedicated equipment and an acoustical coupler by telephone. Connectivity rates were on the order of 300 baud per second. The Internet, with ARPANET as its predecessor in the early 1960s, provided telnet (remote computer access) at increasing rates. The World Wide Web (an invention of the early 1990s) has expanded database/end user interfaces in remarkable ways. The digital revolution, including the Internet in all its manifestations has also increased information transfer rates from 300 baud to multiple megabits. This allows not only more information to be transferred at any given time over any distance, it has also permitted the development of systems interfaces (GUIs) to simplify the process and interpretation of the download.

New online databases that provide bibliographic and full-text access to information resources have proliferated and the volume of electronic information content now available from the desktop is staggering (Lyman and Varian 2000) – and it was recognized twenty years ago that the volume of information was already beyond our ability to absorb the increase (de Sola Pool 1983). Library catalogs have been computerized¹ and are available and interoperable across the Internet. Audio, video, and multimedia resources have come available. Interactive services from games to banking are now available. Filtering and push/pull delivery services have been developed to help us manage information proliferation.

This change in the face of information management has led to major redefinitions of the basic tenets of the library and information science professions. It has changed some basic assumptions. It has brought new demands and new tools to respond to those new demands.

Electronic collection management and electronic information services are being pushed by the new technologies in the information field, but are also being pulled into being by heightened user expectations. In this paper we explore some of the theoretical and practical aspects of collection management in the digital age. We will also look at the major trends in electronic user services including electronic information delivery and electronic reference. Finally, we address the challenges in user and personnel education in response to an increasingly information literate user population. The Internet has raised information absorption rates and it has had a fundamental impact on information institutions – including libraries, the media, entertainment, and so on – particularly as end users and information intermediaries become more “digital information”-capable and literate. This, in turn, raises awareness and, therefore, expectations.

1.1 The digital revolution in libraries and information centers

As a key institutional structure for providing information “collection” and “services” to users, the library or information center has had to respond rapidly to a changing external publishing environment.

The Internet and most recently the World Wide Web have impacted libraries and their delivery of service in ways unthought of except by visionaries like Vannever Bush (1945) or H.G. Wells (1937). Libraries continue to fulfill their mandates. But they do it in ways different than they once did. William Birdsall (1994) makes the interesting argument that we should not conceive of “library” as “place,” but rather of process or of service. If we accept that “library” is something other than “place,” our understanding and acceptance of library function and continuity are maintained as libraries transition from, in Negroponte’s (1995) terms, atoms to bits. Therefore, some of the issues explored for electronic information management are similar to those for information management in general, although perhaps in slightly different garb.

We now distinguish between three different types of libraries: traditional libraries, digital (electronic or virtual) libraries, and hybrid libraries. Hybrid libraries are defined as libraries with both “conventional” print based and digital collections, whereas traditional libraries have “physical objects” and digital libraries are byte based (see Pinfield et al 1998). Depending on who is speaking, hybrid libraries may be the model for the foreseeable future (Leggate 1998) or a way-station to another form (Oppenheim and Smithson 1999). A recent Web publication The HyLiFe Hybrid Library Toolkit (2002) provides guidance to those seeking to develop or migrate to hybrid libraries.

According to the Digital Library Federation, digital libraries have very much the same form and function as other library types:

Digital libraries are organizations that provide the resources, including the specialized staff, to select, structure, offer intellectual access to, interpret, distribute, preserve the integrity of, and ensure the persistence over time of collections of digital works so that they are readily and economically available for use by a defined community or set of communities. (Digital Library Foundation <http://www.clir.org/pubs/issues/issues04.html#dlf>).

¹ Michael Buckland (1997, ch. 5) makes the very useful distinction between electronic libraries and automated libraries. Electronic libraries contain electronically stored documents. Automated libraries (which may or may not be also electronic libraries) use automated search and retrieval systems, for example OPACs.

Many libraries have begun the transformation from traditional to hybrid forms (for an example, see Bjoernshaug 1999). At the same time, a number of libraries have begun to emerge that are born digital. As we have already seen, companies like Dialog and LexisNexis started the digital transformation in the late 1960s. By the mid-1990s, many academic libraries and a number of public libraries had begun to embrace the hybrid model. This has caused librarians to begin to rethink some of the basic premises of libraries and among these are the ownership and access and the "just in case" versus "just in time" acquisition models.

Digital libraries, including Web-based collections, are redefining both the role of electronic information storage and retrieval as well as the role of traditional libraries. As Ching-chih Chen (1998) has argued, no cohesive or comprehensive theory of digital libraries has yet to be fully developed. Digital libraries include collections of books, journal articles, graphics, newspapers, and other material in digital format; in sum, collections of digitized content. To be a library, that collection should be organized according to some standard (Chen, 1998).

Michael Lesk (1997) suggests that digital libraries share three common traits: (1) they can all be searched, (2) they can all be accessed from anywhere, and (3) they can all be copied using electronic means without error. Are then digital libraries traditional libraries but more so? Or do they have unique attributes. There are several perspectives. Pinfield et al. (1998) conceive of combined traditional and digital library, an entity they term "hybrid library." Many academic and public libraries have incorporated digital material into their collections if only by incorporating links to that material in their online public access catalogs (OPACs). Libraries might simply "morph" into gigantic and, hopefully, well-organized portals or, as Lancaster and Warner (2001) describe, one model as "switching stations." Atkinson (1993) emphasizes the need for organization, selection, and management of resources in digital libraries, just as these resources are managed in traditional libraries.

Where do libraries go from here? There has been a lot of speculation, some of which has suggested the withering away of the physical library to be replaced by some form of "MyLibrary" as an electronic desktop entity. Indeed, some discipline- or domain-specific "MyLibraries" are already under construction and a number of academic libraries provide some form of "MyLibrary" service to their patrons (Billings 2000). Harold Billings argues that research libraries are becoming huge linked relational libraries. He sees the need for formal relationships among existing libraries to build the mega-libraries that would meet anticipated user needs. The MyLibrary model is already with us. Push/pull technologies bring personalized information to our desktops.

The electronic library, if it is to have meaning, must bring value to collection management and services from that collection. To do so, there must be an articulated collection policy based on sound philosophical underpinnings.

The digital age is upon us. The issues and implications of this revolution for libraries are integral to our concepts and approaches to electronic collection management and information services. Some of the impacts are significant enough that library and information scientists have begun to re-evaluate library science and library theory. It seems clear that libraries will continue to fulfill an important social service, but the how and the why of that service will continue to evolve. For the purposes of this paper, we will use the shorthand of library to represent intermediary groups that includes libraries, information centers, and special collection builders.

2.0 Electronic collection management

The electronic library and collection management in that library are relatively new concepts. The earliest literature dates to the 1970s and 1980s (Harter and Kister 1981, Dowlin 1984). In 1984 Kenneth Dowlin (1984, p. 33) suggested that the electronic library has four attributes: (1) "management of resources with a computer," (2) "the ability to link the information provider with the information seeker via electronic channels," (3) the ability for staff to intervene in the electronic transaction when requested by the information seeker," and (4) "the ability to store, organize, and transmit information to the information seeker via electronic channels." An electronic library utilizes both electronic information resources and electronic means to manage and move those resources.

There are sound reasons for us to consider collection management or as Budd and Harloe (1997) suggest, "content management" in a networked environment. Libraries bring more than organization and intermediation to information collections. They also bring authority. Inclusion in a collection implies pertinence, appropriateness. At the same time, the same information "content" can and will be provided in different "containers."

2.1 The key challenge: Ownership versus access

The move to electronic information management has resulted in a number of debates. "Ownership versus access" has been one of the more important issues. Budd and Harloe (1994) distinguish between the ownership-based and the access-based organization. In the former, collection emphasis is placed on building "on-the-shelf" collections while, in the latter, emphasis is placed on access to resources, regardless of where they are "owned." Value is assessed differently. For the traditional model, the value of a collection is its size. For the access-based library, value is defined as the ability to retrieve useful information. The former library collects "just in case" material is needed; the latter provides it "just in time."

Both models contain pitfalls and problems. Keller (1992b), for example, has argued that "[n]ew access instead of ownership paradigm leads ultimately to an environment where 'all is meta information,' with no or few ideas on the shelves." The issue of access also brings in a whole new set of questions regarding archiving and preservation, intellectual property including fair use, as well as conditions for purchase which have moved to a complex set of conditions in licensing in the case of digital material. Buckland (1997) suggests that libraries consider *ownership* for high demand items and *access* for those in low demand.

Given the spread of digital access, union catalogs, and universal borrowing, it is no longer so important what an information organization contains (owns); rather, the focus is on the services (access) the organization can provide (Ferguson and Kehoe 1993).

2.2 Access models

"Access" to digital information comes through several modes of access. Each of these forms can be considered as part of the "ownership versus access debate" and impacts the new ways of managing electronic collections. The following describes four models now employed in the digital environment. These are the interlibrary loan model, the universal borrowing model, the no fee model, and the fee-based model. In addition, the World Wide Web, as both a content structure and a delivery mechanism, will be discussed in the context of models of access. The interlibrary loan (ILL) model has been with us for many years. Universal borrowing (UB) is a recent phenomenon first seen in the mid-1990s. The fee-based electronic access model dates to the early 1960s with the advent of electronic database services like Dialog. Today, a large volume of "no fee" or "free" services are Web-based and emerged as major resources in the mid-1990s.

2.2.1 Interlibrary loan model

Interlibrary Loan (ILL) is a process by which one library borrows from other libraries materials it does not hold in order to meet the information needs of its patrons. Interlibrary Loan is not a new concept nor is it one that emerged out of the digital revolution. ILL is however facilitated by various online services including electronic union catalogs (like OCLC's *World Cat*) and automatic ILL request services attached to OPACs (Online Public Access Catalogs) and online databases. The ILL community has developed a continuing interest in using the Web and other means to facilitate the ILL process.

The North American Interlibrary Loan and Document Delivery (NAILDD) Project promotes the development of efficient ILL/DD delivery systems using networked technologies. NAILDD has identified three areas of primary concern: "comprehensive and flexible management software, improvements in ILL billing and payments, and system interoperability via use of standards." (Jackson 1998). OCLC has played a major role in developing system interoperability, facilitating billing and financial transfers (IFM or ILL Fee Management), and development of management software. A number of international initiatives led by the Research Libraries Group

(RLG), the Library Corporation (TLC), Ameritech Library Services (ALS), AGCanada, and others have sought to improve system interoperability and information flows, thus enhancing digital access.

OCLC manages an international Interlibrary Loan Service or Global Sharing Group Access Capability (GAC), built upon its union catalog WorldCat. It utilizes a standard Web interface and software (<http://www2.oclc.org/oclc/pdf/printondemand/ill.pdf>).

Many countries have developed model codes for ILL, for example the American Library Association - Reference and User Services Association (ALA-RUSA) Interlibrary Loan Code for the United States (http://www.ala.org/rusa/stnd_inc.html). ILL exchanges among countries are guided by the International Federation of Library Associations and Institutions (IFLA) International Lending: Principles and Guidelines for Procedure (<http://www.ifla.org/VII/s15/pubs/pguide.htm>).

The Interlibrary Loan system is guided by a set of standards (ISO 10160 and ISO 10161). These standards were developed to insure interoperability among electronic ILL systems and their application protocols. These standards and protocols are managed by the ILL ISO Maintenance Agency. The National Library of Canada serves as host.

Typically, ILL exchanges do not require royalty payments to the copyright holder of exchanged materials. Two principles guide. The first is fair use. The second is the right of the "container" owner to dispose of the container as s/he sees fit, including lending it to others. Fair use doctrine limits the number of copies of a work one can make as well as the number of pages that can be copied from larger works. In general, fair use would permit the copying of a single article from a journal or a single chapter for a book with royalty payment. Multiple copies of the same work or a single copy of a larger work could create an obligation to make royalty payments to the copyright holder. One may, however, lend the original copy as often as it is requested. These conditions are noted here because the whole system of access through ILL has been called into question when dealing with digital materials. This is part of the larger intellectual property issues associated with such materials.

2.2.2 Universal borrowing models

The Universal borrowing models (UB) allows libraries to treat authorized users from one system to borrow (access collections) from libraries within a consortium. The term "universal" actually refers to providing access to everyone within a defined group, not universal in the sense of totally opened.

In the United States, two examples of UB arrangements for digital access are:

- Libraries under a common jurisdiction permit intra-jurisdictional lending. For example, in Georgia, public libraries have banded together to form the Public Information Network for Electronic Services (PINES). These libraries are regulated by the Georgia Public Library Service. PINES offers an electronic union catalog and interlibrary borrowing and return services (<http://pines.public.lib.ga.us/>). The Georgia public and academic libraries also participate in GAILEO, to provide system wide commercial database services.
- The Association of Research Libraries (ARL) manages the "Reciprocal Faculty Borrowing Program" among its member university libraries. "Conducted under the aegis of the Research Libraries Advisory Committee to OCLC, the intent of this program is to promote and facilitate scholarly research and communication among faculty members of research universities that are ARL members." Privileges may but do not necessarily include borrowing rights. <http://www.pace.edu/library/collection/FacultyBorrowing.html>.

In the increasingly digital world, the pre-coordinated groups of organizations in consortia have become increasingly active and pervasive due to the need to get the most favorable conditions under licensing agreements. Cost models for publishers of digital information are in serious flux and the need for groups that build collections to work together in their dealings with publishers and in developing access infrastructures for digital collections has become increasingly important.

2.2.3 No fee electronic access

No fee access to digital materials has become increasingly available through the Internet and, thereby, directly to the end user. Materials can be read online or downloaded in a variety of formats, including pdf, Microsoft reader, and html. From the "collection" point of view, providing identification and access to the free sites brings with it a number of issues. Since these are free material and the level of responsibility of the "publishers" vary considerably, collection developers have the difficult challenge of determining whether digital access provides sufficient continuity in their collection development scheme. Maintaining links to free electronic sites is a major collection maintenance challenge for digital collections. Also, because the material is free, most of it is not copyrighted or older out-of-copyright material. One major source of free material that is rather durable and generally of good provenance is US government material, especially policy and technical documents because US government material can not be copyrighted. Some sample sites for free material are:

- Project Gutenberg (<http://promo.net/pg/>), begun in 1971, permits its users to download books.
- Online Books (<http://onlinebooks.library.upenn.edu/>) at the University of Pennsylvania provides portal access to more than 15,000 e-books. It provides pointers to materials in its collection and on the servers of other providers. The text is marked up to provide cross references by hypertext links to material on the same subject in the collection.
- Subject gateways are comprehensive collections of digital and often Web documents organized around a set of central themes. Examples include the WWW Virtual Library (<http://vlib.org/>), BUBL LINK (<http://bubl.ac.uk/link/>), the Internet Guide to Engineering, Mathematics and Computing (<http://www.eevl.ac.uk/>) WebMD (<http://www.webmd.com/>), /) and so on. Preserving Access to Digital Information or PADI (<http://www.nla.gov.au/padi/>) is a subject gateway to digital preservation issues. The Resource Discovery Network (<http://www.rdn.ac.uk/>) is a metagateway, with links to major gateway sites.
- Governments provide Web based database access to a wide range of information. Examples include Thomas, a Library of Congress gateway to US Congressional documents (<http://thomas.loc.gov/>) and Edgar, a service of the Security and Exchange Commission (<http://www.sec.gov/edgar/searchedgar/webusers.htm>).
- E-print and pre-print archives -- Los Alamos National Laboratory broke new bibliographic ground when it established an e-print archive (<http://arxiv.org/> and mirrored at: <http://xxx.lanl.gov/>). This archive and others like it have proved invaluable in fields with fast breaking innovation. Two of the major US science agencies, NASA and the Department of Energy, both have free access to large digital report collections. (<http://www.osti.gov/> for DOE and <http://www.sti.nasa.gov/> for NASA).

There is a major other thrust into free or alternative models of information provision driven by the changing economics of publishing, the increasingly activist user community, and the enabling information technologies around the Internet. This is particularly true in scientific and technical areas where journal costs are fast outpacing libraries' abilities to continue to afford them for their collections. Scholars and universities on the one hand are challenging the journal publication model as too centric and too expensive. Journal publishers on the other hand respond that their costs require economies of scale and higher prices. Some authors are experimenting with self-publication on the Web. And a number of e-journals have been created to add structure to the process. The SPARC (Scholarly Publishing and Academic Resources Coalition) Initiative is one such effort to redefine academic publishing and information dissemination (<http://www.arl.org/sparc/home/>). It is an organization of universities, research libraries, and organizations "built as a constructive response to market dysfunctions in the scholarly communication system." Launched in 1998, the SPARC mission is to enhance access to peer reviewed literature and to act as an alternative delivery mechanism to commercial online publishers.

Many e-journals and some h-journals (hybrid, or journals published in paper and electronically) offer free access to their articles. These include a number of popular and scholarly journals offered in electronic format without

charge or subscription; for example, the venerable *Scientific American* (<http://www.sciam.com/>), as well as the information science journals *Information Research* (<http://informationr.net/ir/>), *D-Lib Magazine* (<http://www.dlib.org/>), *FirstMonday* (<http://www.firstmonday.dk>), *Ariadne* (<http://www.ariadne.ac.uk/>) and *CyberMetrics* (<http://www.cindoc.csic.es/cybermetrics/>). Many newspapers offer free access to all or parts of their editions. These include *El Día*, *New York Times*, *Wall Street Journal*, *Le Monde*, *Helsingin Sanomat*, *The Times of India*, to name a few.

2.2.4 Fee-based access

Fee-based access to information can take several forms. Historically, bibliographic databases were the early entrants into the electronic collection management arena as noted previously. Although the Web initially encouraged free and freely available information, as it is maturing, commercial publishers are actively using it for vending their electronic material. The volume of fee-based access via the Web is only going to continue to increase at an increasingly rapid rate.

Examples of the increasing number and variety of resources available as fee-based services include access to bibliographic and fulltext databases, to online journals, and to electronic books.

- There are a number of electronic databases that provide bibliographic and/or fulltext access to documents. These include services like Dialog, LexisNexis, Westlaw, Ovid, Chemical Abstract's STN, OCLC's *ContentsFirst*, OCLC's *FirstSearch*, CARL UnCover, British Library Document Supply Centre Inside Information and Inside Conferences, ISI Current Contents, ISI - The Genuine Article, and the Canada Institute for Scientific and Technical Information (CISTI).
- There are a number of database providers, like the Thomson Companies, that own a wide array of properties. Their holdings range from the *Physicians Desk Reference*, *Jane's Warships*, and the ISI collections. They also maintain copyright, patent, trademark databases.
- There are a growing number of publishers providing direct individual or library subscriber access to online e-publications. E-publications either replace or supplement the paper version of the journal. There are a variety of models for the publication of e-publications. These include newspapers, magazines, newsletters, and scholarly journals.
- E-book providers are Web based vendors of online and for the most part popular books. They are fee-based services charged to the consumer. There are a number of services that provide access to e-books. See, for an example, eBooks (<http://www.ebooks.com/>). Adobe provides pointers to e-book vendors (<http://www.adobe.com/epaper/ebooks/ebookmall/main.html>). E-books are typically provided in pdf format one page at a time.
- E-journals and h-journals provide journal access either by subscription or association membership. These include *Science* and *Nature*. *The Journal of the American Society for Information Science and Technology* is offered to members in either paper or electronic format (or both for an additional fee). Companies like MCB University Press, Wouters Kluwer or Elsevier offer bundles of online journals to libraries and individuals.

2.2.5 World Wide Web

The World Wide Web is a complex information medium. It is both a repository for information and a transmission vehicle. It provides free public access and increasingly fee-based access to an immense body of digital material. The Web also supports a wide range of interactive services including banking and securities trading. E-commerce has moved into many other areas and it is now possible to purchase a wide variety of goods and services on line. Amazon.com was among the first businesses to move successfully in the Web environment first by offering books for sale and more recently a wide array of products.

The Web was once perceived not only as a supplement for libraries but as a replacement for them. Perhaps Louise Addis is the first information professional, a librarian to appreciate the opportunities the Web can offer as a transfer medium (Berners-Lee 1999: 45) to support a variety of disciplines and library needs (Henderson 2000). It

has been fairly well demonstrated that the Web is neither a library nor a substitute for libraries (Koehler 1999). It is one of many resources in the information environment. The Web offers a number of challenges to the information professional, not the least of which is the ephemeral nature of Web sites and Web pages (Koehler 2002).

2.3 Selection of information for electronic collections

The number, scope, and type of information resources in electronic and print format, as Lyman and Varian (2000) make clear, are overwhelming. There are many sources from which information can be drawn. And there continues to be a need to effectively evaluate those resources. Libraries have long functioned as one of the chief mechanisms for information and evaluation of quality and relevant information sources.

If we take to heart Birdsall's (1994) conception of "library" as process or service rather than "place," libraries must put added focus on how to manage collections. Electronic collection development must be consistent with the mission and an overall collection development plan. At the same time, collection development plans should take into account the electronic resources now available to libraries (Gessesse 2000). As it becomes easier or more efficient to move electronic and physical objects from a collection repository to the end user, the logic of maintaining redundant collections declines. Through selective collections policies, scarce resources can be used to broaden collections rather than to duplicate them.

There are a number of online aids to assist librarians in collection development for either electronic or "traditional" materials. Librarians have discovered that the online booksellers like Amazon provide both a vehicle for purchasing but also offer useful reviews.

With quality and permanence caveats in mind, the Web can be a source for collection development (see Lee 2000). Web material should be subjected to the same scrutiny that any other resource should be subjected to and more so. There are a number of guides on evaluation of Web resources. Matthew Ciolek (1996) and Hope Tillman (2000) have produced excellent Web resource guidance. Stability or permanence is cited as one key criterion for collection selection. There is growing evidence that Web site and page stability can be predicted with some degree of probability (see Koehler 2002, Bar-Ilan and Peritz 1999).

There are Web resources that meet quality and stability tests. Some of these are the e-journals that have begun to proliferate. If efforts like SPARC prove successful, the number of independently published e-journals will no doubt increase. University and government based Web sites provide extensive information. The United States government is seeking to migrate its publicly accessible documents from paper to electronic format. As these trends increase not only should libraries consider these as appropriate for collection, they will have to.

The Web may also serve as a viable substitute for expensive online databases and some traditional collections. Susan Lewis-Somers (2001) has found that there are a number of legitimate high quality free online resources that can be used in place of Westlaw or Lexis for legal research. Indeed, one can draw on *Thomas* and a multiplicity of other government e-publications and services to meet niche requirements.

The Web is sometimes seen as a "free" resource that can be "incorporated" into library collections without regard to collection objectives. In some senses of the word perhaps the Web is a free resource, but the process of evaluation, incorporation, and maintenance of that part of the collection is both complex and expensive.

Finally, Keller (1992a) makes the very important observation that despite the metadata and sophisticated access systems, access is for the most part a question of "to what" rather than "how." Libraries must maintain good, current, and appropriate collections – however constructed – to meet the needs of their users. In order to maintain those collections, Peggy Johnson (1997) argues persuasively for formal electronic collection policies that reflect the changing landscape and that provide information workers with the guidance and a decision framework. As we have seen, in an Internet world, the need to discover and select quality relevant materials is as important as in the

“print” world but it is as yet very difficult to do. Guidelines, such as those provided by Tillman (2000) or Ciolek (1996) are critical and should be employed with rigor.

2.4 Acquisition

Information can be acquired through a variety of means as was discussed in the previous sections. Library historians may recall that the acquisition policy of the first library at Alexandria was very straightforward – by law any manuscript entering Ptolemaic Egypt had to be deposited at the library so that it could be copied and incorporated into the collection. Copyright and fair use practices no longer permit such direct taking of the intellectual and physical property of others. A number of principles and laws have been developed that regulate the use of information.

In a paper-based world, the intellectual property had a physical form and, therefore, only one person could possess or use it at a time. Acquisition was the purchase of a commodity. Certainly, with the advent of photocopying machines, issues arose on the premise of one copy, one possession. To deal with this, copyright has traditionally been balanced by the fair use doctrine. Fair use regulates the rights and privileges of information users to access and use the intellectual property of others. These fair use rights range from quotation, citation, copying, and perhaps in cyber-documentation to hypertext linking of one Web page to another. As technology has advanced, limits have been placed on fair use doctrine. For example, one such limit was established by the Texaco case (*American Geophysical Union v. Texaco, Inc.*, 60 F.3d 913 (2d Cir. 1995)). Texaco spoke to the “one legal copy” principle and found that wholesale photocopying of journals was a copyright violation. Thus, the principles of fair use were tested and interpreted for collections builders. In the electronic world, when digital reproduction was effortless and limitless, the issues of fair use became very important for publishers. They saw the need for additional limits. With the *Ticketmaster v. Microsoft* (United States District Court for the Central District of California, Civil Action Number 97-3055DPP 1997) case we find that the “capture” of someone else’s Web page or trademark within a frame may constitute an unfair taking. However, in *ACLU of Georgia v. Miller* (43 U.S.P.Q.2d 1356, 1996), the court may have recognized a right to link.

A principal related to fair use; i.e., the “principle of first sale”, means that the purchaser of an “information container” may transfer ownership of the container to whomever and whenever that owner wishes to do so. The principle, however, does not extend to all uses of the “contents” of that container. Copyright serves to protect the information proprietary interests of the copyright holder who sometimes may be the original creator of the work, but more often is the publisher. The combination of these two principles is currently being tested in institutions building e-collections and e-services.

Because of the economic implications for these intellectual property issues in the digital environment, in recent years, information suppliers have begun to move away from the sale of information to the licensing of information. The digital revolution has significantly changed the ways in which information can be packaged. It need no longer be offered within “physical packages.” It can now be transmitted from producer to publisher to end user. That may well render the principle of first sale moot because information containers need not be used. It also means that limits are placed on the ability of the licensee to transfer or transmit information to third parties. For example, libraries can participate in Inter-Library Loan consortia because these libraries own the information packages they are lending. Under most licenses, this lending practice is either prohibited or restricted. An e-book licensed by an academic library from an e-vendor cannot be “lent” to another library for use by its patrons.

To restate, when a book, CD, journal, DVD, videotape, or magazine is put in a digital collection, the institution buys the container together with certain rights of access to the content therein. The rights of the user are limited by copyright and other legal constraints. However, the owner of the container retains the right to access the information so long as s/he owns the container and retains the right to transfer ownership and associated rights to someone else. In the online world, even these concepts are challenged by the definitions of containers as well as by other provisions in licensing agreements restricting what uses can be made of the material.

With this background in mind, organizations may follow an ownership or an access path. Whichever they choose, they must develop acquisitions policies. Acquisitions of electronic or digital materials often entail a set of decisions that differ somewhat from paper (Pinfield 2001). Some of these decisions entail organizational questions. Are electronic acquisitions treated as an intrinsic part of the library collection or are they categorized as "other resources."

As Stephen Pinfield has shown (2001), electronic acquisitions are not without their costs. These costs include the cost of the document (usually in the form of license). These services are offered using a variety of pricing models – individual subscriptions, bundled subscriptions, joint print and e-journal subscriptions, maximum number of users, and so on. The negotiations between library purchaser and licensor vendor can be time- consuming and complex.

2.4.1 Access agreements

Now that acquisitions have taken the form of licenses rather than purchases, there are critical differences between traditional and electronic acquisitions. Licenses represent permission or authorization for one party to use the property of another under a prescribed set of conditions. These licenses may limit the number of users for a database at any given time, they may limit the range of authorized users, and they place a temporal limit on access. Typically, full text providers, particularly e-book databases, place a limit on the number of users at any given time. This is analogous, they argue, to the traditional model. There can be only as many users of a print book as there are copies of the book at any given time.

Many national and international associations have been developing guidance to help information managers negotiate licenses or to better understand their implications for libraries and other users (for example, the American Library Association, the American Association of Law Libraries, the Association of Research Libraries, the Australian Library and Information Association, the Canadian Library Association, the Colegio de Bibliotecarios de Chile, the European Bureau of Library, Information and Documentation Associations to list a few.) These concerns have sometimes resulted in a number of very specific agreements, as for example the International Federation of Reproduction Rights Organizations (IFRRO)--International Group of Scientific, Technical and Medical Publishers (STM) Joint Statements on Electronic Storage of STM material of 1992 (<http://www.ifro.org/papers/stmjoint.html>) and 1998 (<http://www.ifro.org/papers/stmjoint2.html>).

There are also a number of symposia and other training offered on digital copyright and associated issues. Some examples include the International Summer School on the Digital Library in the Netherlands (<http://cwis.kub.nl/~ticer/summer02/>) sponsored by Tilburg University and the Libraries in the Digital Age Conferences held annually in Dubrovnik, Croatia (<http://www.ffzg.hr/infoz/lida/>).

In addition, many professional organizations provide guidance on access, digital content, copyright, and related issues. Examples include:

- Association of Research Libraries (<http://www.arl.org/scomm/licensing/>)
- Copyrightlaws.com (<http://www.copyrightlaws.com/index2.html>)
- International Coalition of Library Consortia (<http://www.library.yale.edu/consortia/>)
- International Federation of Library Associations and Institutions, Licensing Principles (2000) (<http://www.ifla.org/V/ebpb/copy.htm>)
- Stanford University Libraries, Copyright & Fair Use (<http://fairuse.stanford.edu/>)
- Yale Library, Licensing Digital Information: A Resource for Librarians (<http://www.library.yale.edu/~license/>)

Lesley Ellen Harris (2002) has prepared a guide to digital licensing under the American Library Association imprint. Her book provides a series of checklists and commentary. For example, she advises her readers to avoid verbal agreements in favor of the written; in part, because of the potential for future misunderstanding (Harris 2002, xv). Harris (2002, p.100) also makes important distinctions between the sale, the assignment, and the

licensing of rights. An assignment of rights, unlike a sale of rights, is the non-exclusive permanent transfer of rights of access to item under considerations. Licenses are less permanent and are analogous to renting rather than buying the object. A license or an assignment may specify the conditions under which copyrighted material may or may not be used.

Each licensing and assignment agreement is unique. Some may be negotiated between the buyer and the seller. In some cases buyers or sellers may be constrained by prior agreements or institutional regulations that preclude certain arrangements.

1.5 Cataloging

Information cataloging and indexing lie at the heart of collection management and bridges the gap between the collection and many of the service functions. Various cataloging standards were developed with two primary purposes in mind: to describe the collection and to support retrieval of information from that collection.

The digital revolution has impacted cataloging needs as the nature of collections has been changing and going digital. Joan Swanekamp (2000) observes that the cataloging profession has been changed significantly and that there are major technological and volume challenges to original cataloging capacity in an electronic environment.

New and changing technologies and retrospective cataloging have forced libraries to examine management systems and planning processes (Stamm 2000). As new hardware and software come available for library systems, there will be an inevitable impact on library services as adaptations are made. Consortial agreements also have a place in the development and application of metadata. Libraries long ago began to move away from doing all their cataloging in house to outsourcing some or all of the function to centralized facilities like OCLC or the Library of Congress. Electronic bibliographic information facilitates this move to electronic cataloging utilities. OCLC now serves as a center for cataloging for its member libraries. It is the provider of major cataloging systems like PRISM and WorldCat. Participating libraries contribute to the Online Union Catalog and share cataloging records. The Program for Cooperative Cataloging (PCC) provides core-level standard cataloging. A core record represents a minimum acceptable number of fields to allow participating libraries to adopt the record without significant editing or addition (US Library of Congress 1999).

OCLC has also developed a program -- the Cooperative Electronic Resource Description (CORC). CORC is used by participating libraries to describe Web and other Internet resources. Like PCC, CORC participants perform core-level cataloging. CORC software can harvest metadata from metatags (header) and XML markup (body) to populate catalog records. This facilitates the cataloging effort by populating the appropriate Dublin Core or MARC fields. These locally cataloged records become part of the CORC database to be shared among CORC participating libraries. For additional description, see Calhoun and Riemer (2001). CORC records can be and are incorporated in library OPACs, thereby providing catalog access to "unowned but accessible" external resources.

It has been well established that Web pages and sites undergo frequent change including disappearance. CORC periodically rechecks the integrity of URLs and of page content for its member libraries.

2.5.1 Bibliographic Access Tools in an Electronic World

"Metadata" is a relatively new term building on an old concept of cataloging or bibliographic control as a tool for identifying and locating information. Metadata means "data about data." Librarianship has traditionally used the terms "bibliographic control," "cataloging," and "indexing" for "metadata." With the advent of electronic collections, digital libraries, and the Internet, and the increasing availability of numeric and textual databases, information classifiers and catalogers have begun addressing the bibliographic management of distributed databases. The term "metadata" has been adopted to reflect this broader application and bibliographic control of a wide range of information products.

Historically, card catalogs typically were limited to no more than three access points (author, title, subject), two more than the earliest catalogs. OPACs, because of the speed and "agility" of computers, support multiple access points. Computer scientists, and now Internet entrepreneurs, have developed metadata systems for digital libraries and Web search engines. These include systems to automatically capture and harvest imbedded metadata like PICS and Dublin Core as well as the various XML-based mark up systems. These indexes resemble classic indexing structures. Many search engines, for example, follow inverted indexing principles, while many of the search directories are based on faceted chain-indexing models.

A proliferation of metadata and metametadata tools is being developed to provide access to digital information. Metadata issues need also to be understood as information professionals build collections with materials in a growing number of formats, for often different format implies different metadata. A separate paper in this volume addresses metadata systems in more detail.

2.6 Archiving

One of the most significant issues in electronic collection management arising out of the conditions of digital content licenses has to do with the long-term ability to access and preserve the collection. The issues of the specific collection are magnified by the realization that the archival copy in some cases may end up residing only at the publisher and the scholarly record is, therefore, hanging on the viability of those publishers with no assured back-up. This is quite a different situation from that of paper material where the physical ownership lasted in perpetuity, even after subscriptions or standing purchase orders expired, and redundancy across the world's library collections almost assures perpetual preservation of scholarly works. Specifically, in the digital environment, rights to licensed materials mean that the material may become unavailable when the license ends. This is based on the fact that the resources of the e-collection are accessed as a service rather than owned as a traditional commodity. Digital materials may not be maintained in numerous copies at diverse sites. The potential for loss or destruction of intellectual property is increased as the number of storage facilities decreases.

Archiving in the electronic environment is a complex undertaking.² The Task Force on Digital Archiving's 1996 report entitled *Preserving Digital Information* (Commission 1996) concludes that digital archiving systems must be developed if we are to preserve our "digital heritage." Digital information archiving processes are analogous to traditional archiving. William Arms (2000: 254-55) puts it succinctly:

Conventional archiving distinguishes between *conservation* (which looks after individual artifacts) and *preservation* (which retains the content even if the original artifact decays or is destroyed). The corresponding techniques in digital archiving are *refreshing* (aim to preserve precise sequences of bits) and *migration* (which preserve the content at a semantic level, but not the specific sequence of bits).

Gail Hodge (2000a) has done a review of best practices in digital archiving using an "information life cycle approach." She tracks digital material from its point of creation, collection, cataloging, storage, preservation, and access and re-access, with an eye to avoid extinction.

Migration, refreshing, and replication (copying files) require dedicated resources, personnel, and capital. It is well understood that the speed at which the computer/digital revolution is proceeding renders common formats and processes obsolete in a matter of years, sometimes months. Great care should be taken in the development of digital materials. Arms (2000: 260) exhorts us to plan for archiving as we develop digital libraries.

The need for digital archiving has been recognized, but it may be difficult to accomplish. There are a number of competing standards and approaches to digital archiving. Each of these standards fulfills a niche requirement, but none have been recognized to address the range of digital archiving demands. The Gail Hodge (2000b) and Michael Day (2000) bibliographies point us to an array of complex problems. For example, Kevin Guthrie (2001)

² See Gail Hodge (2000b), *Selected bibliography on digital archiving*. [Online]. Available: <http://www.alpsp.org/biblio.pdf>

has questioned the economic feasibility of archiving little used digital documents. Lawrence, et al, (2000) explore risks associated with data migration. Terry Kuny (1998) points to the close association between multimedia materials and the hardware and software needed to access them.

If archiving digital material is complex, archiving the World Wide Web is a nightmare. If most digital documents like their print counterparts are more or less static, Web documents are extremely dynamic. The Web differs from other digital content. Its content undergoes frequent change, movement, and disappearance. Some Web pages and cites change content frequently, others rarely.

A more complete discussion of digital archiving is presented in another paper in this series. But, from the position of digital collection management, it needs to be addressed in terms of the defined goals of the collection.

3.0 Electronic information services

The advent of electronic information services has created a new set of demands for information providers. These services include new reference models, new means for information delivery, and demands for user and personnel education in the uses of the new resources and technologies. It has also prompted a re-examination of the rights and responsibilities of information providers, intermediaries, and end users (see, for example, American Library Association 2000).

A number of services are now offered online that, heretofore, were provided in person or through other print means. Online includes electronic reference and electronic document delivery systems. These services have been expanded to include automated information delivery and built according to various interoperable standards. Electronic information services that have been created include interactive e-commerce and e-governance services as well as various organizational database management needs (including registrations, membership renewals) and other functions.

The advent of electronic information services has also prompted new interest in artificial intelligence systems to facilitate the delivery of information services. These range from natural language processing (see Jacquemin 2001) to the creation of content (see Bringsjord and Ferrucci 1999). These are future directions for services and are only mentioned here.

3.1 Electronic reference

Electronic reference has come to mean several different things. By one definition, electronic reference is interpersonal reference information management using electronic means for the patron query and for the reference response. Libraries have employed this model using telephones for years. E-mail has added a new dimension to the reference relationship. In this form there is still a one-to-one patron to librarian exchange.

A second model for e-reference has been developed and is more impersonal. Often, through email or Web-based queries, patrons place reference questions to anonymous reference librarians. The Internet Public Library provides an "Ask A Question" box with a pledge to respond within three days (<http://www.ipl.org/ref/QUE/>). The British "Ask-A-Librarian" service (<http://www.ask-a-librarian.org.uk/>) incorporates local reference librarians in an online service, with a pledge to respond within two working days.

A third model establishes a reference like interface, the "electronic reference desk." Libraries provide information portals with selected useful online information finding tools. Examples are given in Table 1.

Table 1. Examples of electronic reference desks

Reference Service Title	Location	URL
Electronic Reference Desk	Wageningen UR Library	http://www.bib.wau.nl/genref/
Electronic Reference Desk	University of Melbourne	http://www.lib.unimelb.edu.au/collections/ecocom/eref.html
Electronic Reference Resources	Sourasky Central Library	http://www.tau.ac.il/cenlib/electronic_ref.htm
Electronic Reference Shelf	McGill University	http://www.library.mcgill.ca/refshelf/swsindex.htm
Information Resources for Distant Learners	University of London	http://www.external.ull.ac.uk/ref.asp
IntIndex	SilverPlatter	http://www.silverplatter.com/intindex/intro.htm
Oxford Reference Online (fee-based subscription)	Oxford University Press	http://www.oxfordreference.com
Ready Reference Shelf	University of Michigan	http://www.lib.umich.edu/refshelf/

Libraries have also begun to place online pathfinders on their Web sites. Pathfinders are pre-prepared reference tools designed to point users to resources for commonly asked reference questions. These pathfinders may focus on locally held resources or they may take advantage of Web based resources. For an example of a set of pathfinders, see the Internet Public Library pathfinder page at: <http://www.ipl.org/ref/QUE/PF/>. Building pathfinders requires some html knowledge, excellent reference skills, and a grounding in Web evaluation techniques.

FAQs (frequently asked questions) are a variant on pathfinders and "ready reference" that have developed in the Web environment. FAQs, as the name implies, are lists of questions and answers to those questions client, patrons, browsers, and others have asked of the Web site creator. They provide a ready resource to many questions that might be asked and save time for all parties.

3.2 Information delivery

Libraries and other information providers are moving to augment or change traditional models by providing a wide array of electronic services. A recent example is the library at Los Alamos National Laboratory. This library is helping to meet the information needs of LANL scientists and engineers with the Library Without Walls concept. The LANL LWW provides services to its patrons at all times using electronic information delivery, enhanced data base access, and customized linking between bibliographic and full text resources. The LWW also maintains a close working relationship with the LANL preprint archive (Pack and Pemberton 1999). It also provides electronic information dissemination through a "MyLibrary" service to its patrons.

Selective Dissemination of Information (SDI) and document delivery systems are of long standing in the library community. Document delivery is a library-managed courier service to move requested documents from the repository to the end user and back. Many libraries have long provided such services by moving physical objects. They now provide electronic document delivery by fax or through transmission of digital documents by ftp, telnet, e-mail attachment or the Web. Indeed the services offered by such companies as Amazon.com, Borders, or Barnes and Noble represent a form of document delivery provided by the commercial sector.

SDI represents a slight variation on the document delivery model. Under the SDI model, documents are delivered to end users based on some other criteria than specific demand for the object. This may be a user profile developed by the librarian in cooperation with the end user and be based on end user interests. Many vendors and some libraries may suggest additional documents of potential interest to the end user by offering "more like these" services.

Electronic Information Delivery (EID) is a variation on SDI models that uses the growing power of Web technology and content-oriented standards to respond to user requests from distributed content sources. A number of digital EID systems have been developed based on eXtensible Markup Language (XML) markup, the building

of complex indexes, and filtering mechanisms (Altinel and Franklin 2000). XML is designed for the specific purpose to structure database information so that user queries can get better content responses. It uses "HTML-like" syntax to provide application specific meaning to digital documents through character string mark up (W3C(c)).

These SDI "push" technologies automatically provide end users with information based on predetermined interests. These interests may be established from a profile developed by interaction with the end user. Or they may be developed based on the behaviors over time of the end user. News, weather bulletins, and stock quotes are common examples of information pushed or streamed to the desktops or pages of information consumers (Dysart and Jones 1995).

"Pull" or demand technologies require the user to be proactive. They require interaction at the transaction time between the end user and the information provider. This is, in classic terms, the interaction between a reference librarian and a patron (Small Helfer 1997). More recently, interactions between end users and search engines represent "pull" interaction because the end user is involved in the identification and "pulling" to him or herself of the desired documents.

Most hybrid libraries offer some form of electronic pull. Clearly, the OPAC represents an interactive system for information discovery and retrieval. Some academic libraries offer electronic reserve services for their faculty and students. Reserve librarians place scanned or digitized documents to retrieved and viewed remotely by students on demand. Full text databases, like netLibrary, CarlUncover or OCLC's ArticleFirst may be used to pull documents either directly by the end user or through a librarian intermediary.

It is most interesting to note that the relationship between reference and information delivery is rapidly being redefined whereas information identification and then full text delivery used to be two distinct processes. As information is born and managed digitally, the identification of what a user needs is often only a click away from getting that information.

3.3 User and personnel education

User and personnel education in information resources and access have been traditional library functions from training in school and public libraries to orientation and bibliographic instruction at the university level. Because of the explosion in digital and online resources and the frequent change in technologies and standards, libraries have had to develop in-house training programs for users and staff. They have also brought pressure on librarian training facilities to enhance the skills of their graduates in these areas. In addition, the advent of the WWW made easy access to information over the Internet a reality. With the advance of search engine technology, came a revolution in information literacy and information use. This brought new demands on information professionals as well as many new public policy issues such as the digital divide.

In many countries, academic and public libraries have been identified as among the key institutions that are to assist in bridging the digital divide. In order to address these issues, information entities must not only train and retrain staff in the use of electronic technology, they must also familiarize their patron or client base in the use and scope of those technologies.

In the United Kingdom, The Peoples' Network is a government funded undertaking to bridge the digital divide. Using lottery-derived funds passed through the New Opportunities Fund, the object of the project is to provide universal Internet access, digitize local resources, and to teach online skills to the public. The program offers a useful checklist for personnel training and the areas that need coverage. To help implement the plan, public library staff are to be provided with an eight-point set of Information and Communications Technology (ICT) skills (<http://www.peoplesnetwork.gov.uk/training/background.asp>):

1. A grounding in core ICT fundamentals
2. Understanding how ICT can support library staff in their work

3. Health and safety and legal issues in the context of ICT
4. Knowing how to find things out on behalf of users
5. Using ICT to support reader development activities
6. Using ICT to support users to ensure effective learning
7. Ensuring effective management of ICT resources in libraries
8. Knowing how to use ICT to improve their own professional efficiency and to reduce administrative an bureaucratic burdens"

More advanced skills include:

- "1. Net navigator - in-depth searching skills; validating Web sites; and using alerting services;
2. Information technology gatekeeper - web design skills; mounting and updating information; setting up and managing email databases; designing specialist interfaces; and setting up digital links;
3. Information consultant - analysis and diagnosis of users needs; awareness of information sources; building partnerships with other information providers; and information design and presentation;
4. Information manager - strategic planning; understanding regulatory and legislative requirements; content creation skills; and
5. Educator - training other staff and users to use ICT effectively and designing learning materials and programmes."

In addition, the New Opportunities Fund provides ICT training to teachers and school librarians. Guidelines and expected outcomes can be found at http://www.canteach.gov.uk/info/ict/nof/tta00_06.pdf. The guidelines include use and selection of electronic materials to support the curricula. Training is guided by a consortium headed by the [British] Library Association (<http://www.la-hq.org.uk/directory/training/laict2.html>).

Most libraries have patron training and education programs on "how to use the library." This may involve in-library training and tours and, sometimes, online tutorials (see <http://www.libraries.psu.edu/crsweb/instruction/ip/tutorials.htm>). Most of these programs now include the use of electronic resources. The Internet Public Library provides an example on Web searching and resource quality evaluation at <http://www.ipl.org/ref/websearching.html>.

Students consistently show poor quality selection ability when choosing web materials. If Web documents are to be incorporated in library collections, it is incumbent on libraries to provide assessment as well as search/retrieval training to patrons as well as staff.

3.0 Conclusions

Electronic collection management and electronic information services are in a period of rapid transition. Information organizations are undergoing redefinition. New forms of digital libraries and information collections are providing more information to more users more easily and on demand. These changes are being felt and responses are being made by information professionals throughout the world. The value of information is more appreciated than ever. Changes in copyright law have been pushed by and have left many new challenges in the e-world. The structures of information delivery have been revolutionized by electronic information and the Internet.

Information collections are no longer geographically bound. For example, founded in 1967 as the Ohio College Library Center, the Online Computer Library Center or OCLC is no longer "Ohio-centric." It provides its services to the world. Similarly, using Web access, it is possible to search the OPACs of many of the world's libraries and to utilize a number of their online resources. Thus online and hybrid libraries have global reach. With global reach comes global responsibility.

The technology used to manage the information changes allows for extensive innovation in information selection description, distribution, retrieval, and use. The new e-publishing environment requires totally new ways to assess

information for the purpose of selection. There is a new array of information markup and cataloging systems for collection management that, in turn, supports an equally growing array of information services for information producers, consumers, and intermediaries.

The full story for electronic collection management and electronic information services has yet to be told. These many changes and challenges give new meaning to the expression "may you live in interesting times."³ We are indeed living in interesting times and they will become more interesting still.

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³ For an interesting discussion of the origin of the expression and the Chinese source urban legend for "May you live in interesting times," see Stephen E. DeLong. "Sidebar: Get a(n interesting) Life!" <http://hawk.fab2.albany.edu/sidebar/sidebar.htm>.

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